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Commissioner for Patents

In response to the Order Returning Undocketed Appeal to Examiner by BPAI on Apr 9, 2004, a copy of full English language translation of Japanese Patent Document 02082304 is attached.

CHONG H. KIM
PRIMARY EXAMINER

PTO 04-3339

Japanese Kokai Patent Application
No. Hei 2[1990]-82304

OIL TANK FOR ISOTHERMAL CONTROL

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OIL TANK FOR ISOTHERMAL CONTROL

[Koon seigyo yo yuzo]

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[There are no amendments to this patent.]

Claim

An oil tank for an isothermal control, characterized by the fact that in an oil tank for an isothermal control that can be controlled to maintain an oil stored in a tank at a prescribed temperature and is constituted by installing a cavity, whose temperature is controlled, in an immersed state into the above-mentioned stored oil in the above-mentioned tank, an intermediate cover is installed in the above-mentioned tank so that it may contact the entire upper surface of the above-mentioned stored oil; at least part of the intermediate cover is constituted as a floater

type cover that can be vertically moved along with the displacement of the upper surface of the above-mentioned stored oil; and the upper space of the above-mentioned intermediate cover is always purged with an inert gas.

Detailed explanation of the invention

Industrial application field

The present invention pertains to an oil tank for an isothermal control that can be controlled to maintain an oil stored in a tank at a prescribed temperature and is constituted by installing a cavity, whose temperature is controlled, in an immersed state into the above-mentioned stored oil in the above-mentioned tank.

Prior art

Such an oil tank for an isothermal control is generally provided with a property in which the thermal uniformity is excellent and the thermally uniform area is also widened. Therefore, for example, it is appropriately used for the case in which it is necessary to maintain a relatively wide range of a cavity, whose temperature is controlled, at relatively high various prescribed temperatures (for example, about 50-250°C) with good precision, like a cavity for forming a standard black furnace being used as a corrector of an infrared thermometer (radiation thermometer).

Then, the conventional oil tank for an isothermal control was constituted as shown in Figure 3.

In other words, S is a tank for storing an oil O (for example, a cylinder oil as a heat medium) up to a prescribed oil level and is equipped with upper cover 1, overflow opening a, and overflow tank b. Its inner upper space is released to the atmosphere via the above-mentioned overflow opening a and overflow tank b. Also, in the tank S, in order to be able to maintain the above-mentioned stored oil O at a prescribed temperature, heater H for heating, stirring blade F, oil temperature sensor TH for controlling the feedback to the above-mentioned heat H for heating, etc., are installed, and a cavity K whose temperature is controlled is installed in an immersed state into the above-mentioned stored oil O.

Also, since the volume change ratio to the temperature change of the above-mentioned stored oil O is relatively large and the temperature control range for the stored oil O is very wide (about 50-250°C) as mentioned above, the above-mentioned overflow opening a and overflow tank b are installed to allow escape of a large volume expansion being generated when the temperature of the stored oil O is raised.

Problems to be solved by the invention

However, there were the following various problems in the oil tank for an isothermal control with the above-mentioned conventional constitution.

In other words, since the inner upper space of the tank S and the overflow tank b are released to the atmosphere, the evaporation area of the stored oil O is wide, and the amount being evaporated is very large. Therefore, the consumption of the stored oil O is large, and the risk of fire from an ignition is also high. At the same time, since the stored oil O is oxidized by oxygen in the air, its degradation is severe, and a gelation phenomenon is generated at about 250°C, so that its viscosity is rapidly raised. Thereby, a uniform temperature control is difficult, and the life of the stored oil O is very short. Furthermore, the controllable temperature is limited to about 250°C, and the cavity K whose temperature is controlled cannot be controlled to a temperature higher than that. Furthermore, since the oil discharged to the above-mentioned overflow tank b contacts with the outer wall surface of the tank S at high temperature, a large amount of oil smoke is generated, so that an offensive odor is generated, thereby having a negative influence on the surrounding environment.

The purpose of the present invention is to develop and provide an oil tank for an isothermal control that can solve all the above-mentioned conventional drawbacks.

Means to solve the problems

In order to achieve such a purpose, the present invention is characterized by the fact that in the oil tank for an isothermal control having the above-mentioned fundamental constitution, an intermediate cover is installed in the above-mentioned tank so that it may contact the entire upper surface of the above-mentioned stored oil; at least part of the intermediate cover is constituted as a floater type cover that can be vertically moved along with the displacement of the upper surface of the above-mentioned stored oil; and the upper space of the above-mentioned intermediate cover is always purged with an inert gas.

Operation

The actions being exerted by the above-mentioned characteristic constitution are as follows.

In other words, in the above-mentioned oil tank for an isothermal control of the present invention, as will be further clarified from the description of an application example which will be mentioned later, as a means for the volume expansion due to the temperature rise of the stored oil in the tank escaping, instead of the conventional constitution in which the tank is formed as an atmosphere release type by installing the overflow opening and the overflow tank in said tank, the floater type intermediate cover which contacts the entire upper surface of the stored oil and in

which at least part of it can be vertically moved along with the displacement of the upper surface of the stored oil (that is, the volume change of the stored oil) is installed in the tank, so that said tank is constituted as a substantially closed type. Thus, the evaporation area of the stored oil can be nearly zero, and the amount being evaporated can be suppressed to the extreme. Thereby, the amount of stored oil being consumed can be reduced much more, and the risk of fire from an ignition can also be very low. Also, the surrounding environmental pollution program in which a large amount of oil smoke is generated and an offensive odor is generated in the conventional constitution can be reliably prevented. Furthermore, since the upper space of the intermediate cover in the above-mentioned tank is always purged with an inert gas and the above-mentioned stored oil does not contact the atmosphere containing oxygen, the stored oil seldom contacts oxygen, and the degradation due to the oxidation is difficult to cause. At the same time, a crosslinking reaction is also difficult to cause when a silicone oil with high-temperature characteristics superior to a cylinder oil is used as the stored oil. Thus, the life of the stored oil and the uniform and good-precision temperature control can be assured over a long term. Furthermore, as mentioned above, in case the silicone oil with relatively excellent high-temperature characteristics is used, the heat-resistant temperature of the stored oil can be raised up to 300°C or higher from the conventional at about 250°C. Therefore, the controllable upper limit temperature can be raised to about 300°C.

Application example

Next, a detailed application example of the oil tank for an isothermal control of the present invention is explained based on the figures (Figures 1 and 2).

In the vertical sectional side view of Figure 1 and the front view of Figure 2 (I-I line arrow view of Figure 1), S is a tank for storing an oil O (in this example, a silicone oil that is much more difficult to be oxidized than the conventional cylinder oil is used) as a heat medium up to an approximate prescribed oil level. At its upper opening, an upper cover 1 is installed, so that a substantially closed type tank is constituted as a whole. At the same time, an insulation material 2 is filled into the space in the wall with a double structure, so that an insulated tank is constituted.

Then, in the above-mentioned tank S, a cavity K, whose temperature is controlled, is installed in an immersed state into the above-mentioned stored oil O, and a pair of heaters H and H for heating (an electrothermal type in this example) and a pair of stirring blades F and F are installed so that the above-mentioned stored oil O can be maintained at a prescribed temperature. Also, in the figures, 3 is a window of the above-mentioned cavity K whose temperature is controlled, and infrared rays being radiated via the window 3 are referred as a reference temperature from a standard blackbody for correction of an infrared thermometer (radiation

thermometer), for instance. Also, the above-mentioned pair of heaters H and H for heating and pair of stirring blades F and F are arranged symmetrically to the above-mentioned cavity K whose temperature is controlled so that uniform heating and stirring may be enabled for the stored oil O with a relatively high viscosity. Also, the above-mentioned pair of stirring blades F and F are driven at the same number of rotations via power transmission means such as pulleys 4 and 4 by a common motor M.

Also, in the above-mentioned tank S, an intermediate cover N is installed so that it may contact the entire upper surface of the above-mentioned stored oil O. In the intermediate cover N, its approximate half is constituted by a fixed cover N1 fixed at a prescribed height position, and the remaining approximate half is constituted by a floater type cover N2 that can be vertically moved as shown by an arrowhead X in Figure 1 along with the displacement (that is, the volume change of the stored oil O) of the above-mentioned stored oil O. Also, the shaft parts of the above-mentioned heaters H and H for heating and the stirring blades F and F penetrate through the fixed cover N1 of the above-mentioned intermediate cover N, and the penetrated portion of the shaft part of the stirring blades F and F being rotated among them, through holes 5 and 5 with a slight margin are formed around the shaft part. The reason for this is that it is difficult to constitute an appropriate seal mechanism that can withstand a high temperature over a long term. Also, in the above-mentioned intermediate cover N (N1, N2), several oil temperature sensors TH, etc., for controlling the feedback to the above-mentioned heaters H and H for heating are fixed in a state in which they penetrate through the intermediate cover.

Furthermore, an inert gas G (nitrogen gas in this application example) is directly introduced into the through holes 5 and 5 formed in the fixed cover N1 of the above-mentioned intermediate cover N from a purging gas inlet 6 installed at the above-mentioned upper cover 1 by blowing (however, it is mildly carried out at each small amount), and the inert gas G introduced is naturally circulated in the space between the above-mentioned upper cover 1 and the intermediate cover N (N1, N2) and slowly discharged to the outside from a purging gas outlet 7 installed at the above-mentioned upper cover 1. Thus, the upper space of the above-mentioned intermediate cover N (N1, N2) in the above-mentioned tank S is always purged with the inert gas G. Also, the inert gas G being filled into the upper space of the intermediate cover N (N1, N2) in the above-mentioned tank S also exerts a function of an insulating layer, the above-mentioned stored oil O is difficult to be influenced by an external air.

On the other hand, in the above-mentioned application example, part (half) of the intermediate cover N is constituted as the floater type cover N2 that can be vertically moved along with the displacement of the upper surface of the stored oil O. However, in the penetrated portion of the shaft part of the above-mentioned heaters H and H for heating, if through holes

with a slight margin are installed around the shaft part, the entire intermediate cover N can also be constituted as a floater type cover.

Effects of the invention

As seen from the above-mentioned description, according to the oil tank for an isothermal control of the present invention, the intermediate cover is installed in the above-mentioned tank so that it may contact the entire upper surface of the stored oil in the tank, at least part of the intermediate cover is constituted as a floater type cover that can be vertically moved along with the displacement of the upper surface of the above-mentioned stored oil, and the upper space of the above-mentioned intermediate cover is always purged with an inert gas. Thus, the evaporation area of the stored oil can be nearly zero, and the amount being evaporated can be suppressed to the extreme. Thereby, the amount of stored oil being consumed can be reduced much more, and the risk of fire from an ignition can also be very low. Also, the surrounding environmental pollution program in which a large amount of oil smoke is generated and an offensive odor is generated in the conventional constitution can be reliably prevented. Furthermore, the degradation due to the oxidation and the gelation phenomenon are difficult to cause, so that the life of the stored oil and the uniform and good-precision temperature control can be assured over a long term. Furthermore, in case a silicone oil with relatively excellent high-temperature characteristics is used, its heat-resistant temperature can be raised up to 300°C or higher from the conventional of about 250°C. Therefore, the controllable upper limit temperature can be raised to about 300°C.

Brief description of the figures

Figures 1 and 2 show a detailed application example of the oil tank for an isothermal control of the present invention. Figure 1 is its vertical sectional view, and Figure 2 is its I-I line arrow view.

Then, Figure 3 explains the technical background of the present invention and the conventional problems and shows an outlined vertical sectional side view of an oil tank for an isothermal control with a conventional constitution.

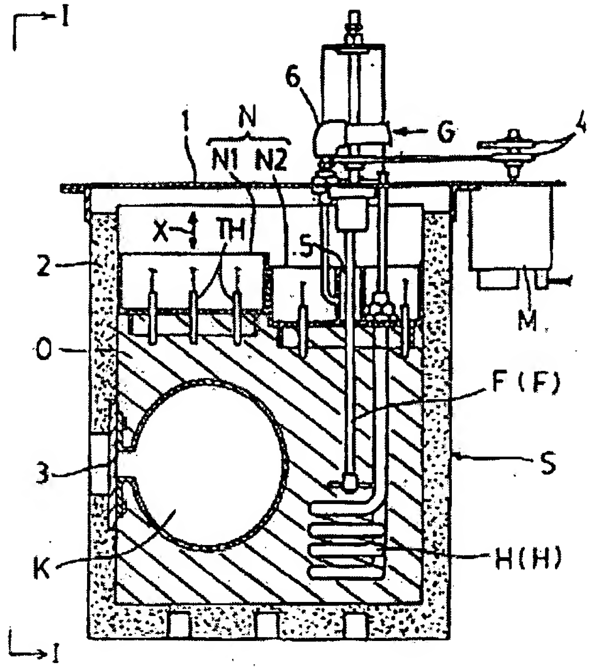
S Tank

O Oil

K Cavity whose temperature is controlled

N(N2) Floater type intermediate cover

G Inert gas for purging



S……槽、

O……油、

K……被温度制御空洞、

N（N2）……浮子式の中蓋、

G……パージ用の不活性ガス。

Figure 1

Legend:		
	S	Tank
	O	Oil
	K	Cavity whose temperature is controlled
	N(N2)	Floater type intermediate cover
	G	Inert gas for purging

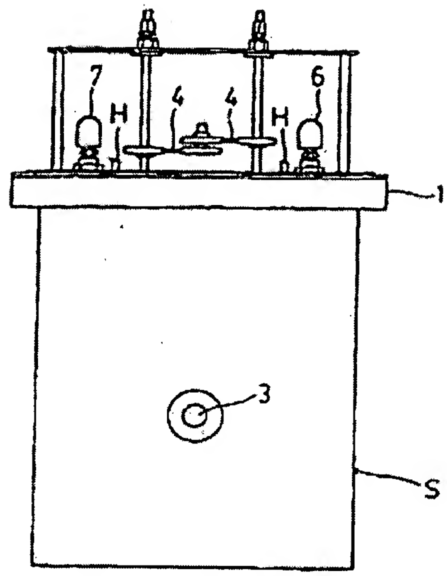


Figure 2

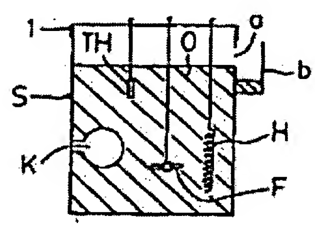


Figure 3